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Many production wells in North Sea reservoirs suffer from intense productivity reduction during primary production. These reservoirs are naturally fractured reservoirs; hence, fractures probably take main responsibilities for this decline. During a primary recovery, pressure-depletion increases effective stresses; and increases contact stresses on the fracture surfaces, subsequently reduces a fracture aperture and the fracture hydraulic conductivity. The objective of this study is to investigate the extent of mechanical effects on the fracture closure and corresponding productivity reduction. Flow through fractures are modelled using the cubic law, the fracture stiffness is captured using both linear and classic Barton-Bandis model. The equations are solved both analytically (for simple geometry) and numerically using the finite element code, CSMP (see Figure 1). The production history of a well in the North Sea has been used for benchmarking, and sensitivity analysis is performed to understand the effect of each parameter on the productivity reduction as well as interactions between each variable.

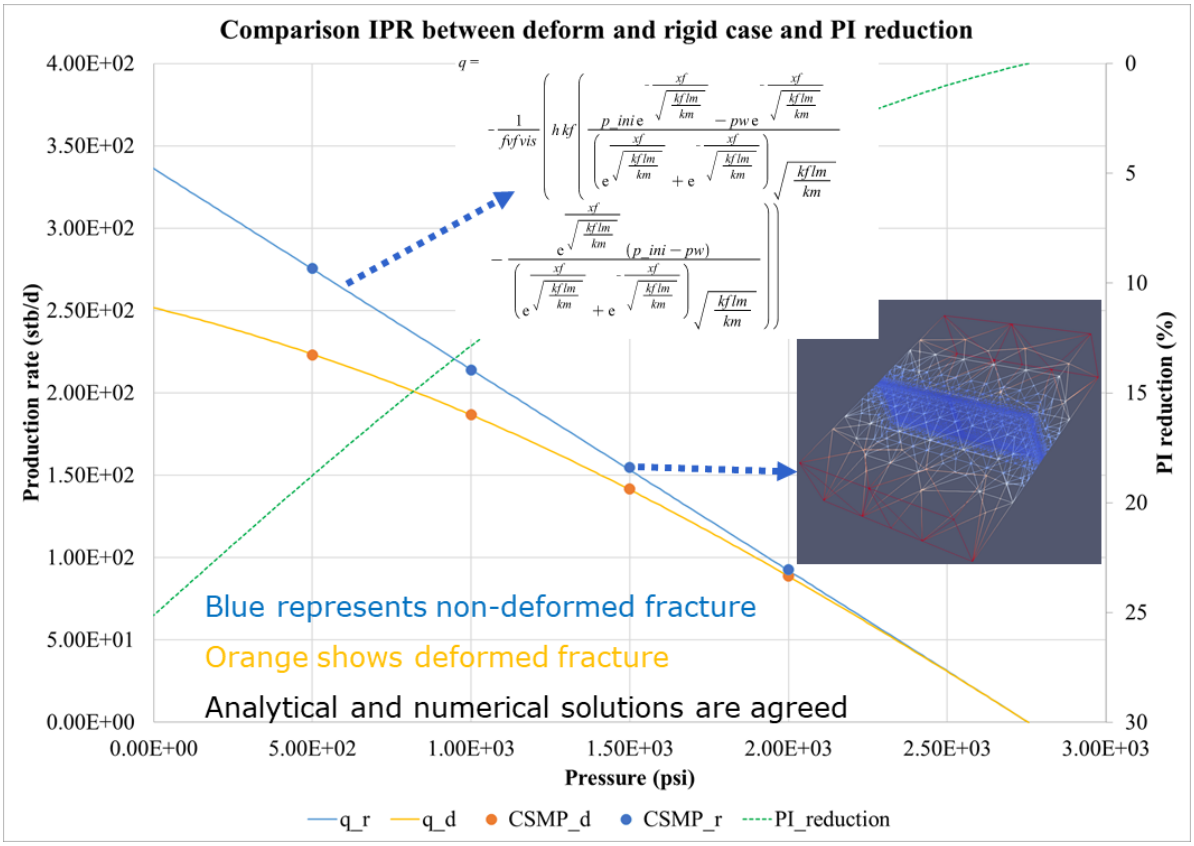

Figure 1 Steady-state production comparison between analytical and numerical solutions